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(21) International Application Number: PCT/SE97/00030 (22) International Filing Date: 13 January 1997 (13.01.97) (30) Priority Data: 9600502-0 12 February 1996 (12.02.96) SE (71) Applicant: TELIA AB [SE/SE]; Mårbackagatan 11, S-123 86 Farsta (SE). (72) Inventor: RAGNARSSON, Mats; Ryavägen 28, S-191 62 Sollentuna (SE). (74) Agent: KARLSSON, Berne; Telia Research AB, Rudsjöterrassen 2, S-136 80 Haninge (SE).		(81) Designated States: NO, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: METHOD FOR EVALUATION OF ANTENNA TILTINGS (57) Abstract The present invention relates to a method at a mobile telecommunications system which allows evaluation of antenna tiltings by means of utilization of statistical data from CTR-measurements or corresponding measurements. From these CTR-measurements one obtains measurement values of the signal strength in both uplink and downlink, and values of TA. By converting geographical distances into TA-units one can make statistics of the average signal strength distributed per TA. This is made both before and after the tilting. By reading the statistics one consequently gets a picture of how the tilting has changed the coverage area of the base station.		

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TITLE OF THE INVENTION: METHOD FOR EVALUATION OF
ANTENNA TILTINGS

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TECHNICAL FIELD

The present invention relates to a method at a mobile telecommunications system which allows evaluation of antenna tiltings.

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PRIOR ART

A base station has excess range when a radio signal reaches further (geographically) than what is good from interference point of view. It can cause problems for other
15 base stations with the same or neighbouring frequencies which then will be interfered with. This often can be remedied by tilting the antennas of the interfering base station. When an antenna is tilted, one changes the direction of its main lobe in the vertical plane from
20 having pointed in straight horizontal direction to point a number of degrees below the horizon. This results in that the signal from the antenna is attenuated at places which are located far from the antenna and remains unchanged or will increase at places which are located near the antenna.
25 The effect of this is depending on a certain number of parameters, such as the height of the antenna, what the surroundings of the antenna looks like, the qualities of the antenna, and the tilt angle of the antenna. By tilt angle is meant the angle in which the main lobe of the
30 antenna in the vertical plane is arranged in relation to

the horizontal plane. The tilting can be made both mechanically and electronically.

When one tilts an antenna, one theoretically can calculate how big the tilt angle should be. However there
5 are problems at following up whether the theory is in accordance with reality. The method which exists today is to measure the field strength of the coverage area of the antenna both before and after the tilting. Field strength measurement of a territory is resource demanding because
10 one has to drive around in a car and measure a geographical area, the size of which is depending on the coverage area of the antenna.

The aim with the present invention consequently is to provide a method which is less resource demanding and more
15 cost efficient than the above mentioned method to measure the field strength at just any places within a geographical area.

In order to find out whether the prior art provides any method of above described kind, a pre-search was made, at
20 which the following documents were found: US-A-4 881 082, US-A-4 249 181, EP,A1 586 507, EP,A1, 575 808, JP,A,6-140 985, EP, A2, 531 090, WO,A1, 95/04934.

These documents, however, only describe different types of arrangements to reduce fading and interference between
25 base stations and mobile units by tilting antennas.

The documents consequently are not relevant for the present invention.

BRIEF DESCRIPTION OF THE INVENTION

The above mentioned aim is achieved by a method which is characterized in that statistical measurement data of the field strength values of the mobile units at different geographical places are utilized both before and after the antenna tilting, at which one by reading and comparing the measurement data gets a picture of how the antenna tilting changes the coverage area of the base station.

Further advantages of the present invention will be evident from the independent patent claims.

In the following a detailed description is given of one embodiment of the present invention.

DETAILED DESCRIPTION OF AN EMBODIMENT OF THE PRESENT INVENTION

The method which in this embodiment is utilized for measuring of field strengt is called CTR (Cell Traffic Recording). The CTR-mesurement is a conventional method developed by Ericsson.

It shall of course be realized that other, equivalent methods can be utilized for determination of the signal strength in different geographical points.

In CTR (Cell Traffic Recording) one can get the max. values of the signal strength in both uplink and downlink from max. 16 calls at the same time on a specific base station during a period of 1 to 60 minutes. One also can get the value of TA (Timing in Advance) of all calls. By the TA-value one then can decide the distance with an accuracy of 0,5 km. If TA=0, the distance between the base

station and the mobile unit is 0-0,5 km, if TA=1, the distance is 0,5-1 km etc.

One can by means of information from a map, or a map data base, specify the distance to geographical areas one is interested in. By converting the distances to TA-units (number of 0,5 km intervals) one can make statistics of the average signal strength distributed per TA. This is made both before and after the tilting. One then will get a basis for comparison from which one can find out how much the average signal strenght has been changed per TA-unit. By reading the statistics one can get a picture of how the tilting has effected the coverage area for the base station with an accuracy of 0,5 km distance from the base station.

One also can collect the TA-value and signal strength values by means of loggings in the A-bis interface between BSC (Base Station Controller) and the base station.

The A-bis interface is the interface which is used between the base station and the BSC in the GSM-system. It should of course be realized that for other TDMA-systems than GSM, there is used some other, equal interface.

The above described is only to be regarded as an advantageous embodiment of the invention, and the extent of protection of the invention is only definied of what is indicated in the following patent claims.

PATENT CLAIMS

1. Method at a mobile telecommunications system including at least one base station and just any number of mobile units for evaluation of antenna tiltings,
5 c h a r a c t e r i z e d in that statistical measurement data of field strength values of said mobile units at different geographical places are utilized both before and after said antenna tilting, at which one by reading and comparing said measurement data gets a picture of how said
10 antenna tilting changes the coverage area of the base station.

2. Method according to patent claim 1,
c h a r a c t e r i z e d in that one at said base station during just any time interval measures the field strength
15 in both uplink and downlink and TA in relation to just any number of mobile units, which TA-values decide the geographical distance from said base station to said just any number of mobile units.

3. Method according to patent claim 2,
20 c h a r a c t e r i z e d in that the CTR-method is utilized.

4. Method according to patent claim 3,
c h a r a c t e r i z e d in that the TA-value is determined with an accuracy of 0,5 km.

25 5. Method according to patent claim 4,
c h a r a c t e r i z e d in that information from a map, or a map data base, specifies distances to the geographical areas which correspond to the positions of said mobile units, which distances are converted into TA-units, whereby
30 one gets statistics of the average field strength distributed per TA.

6. Method according to patent claim 2,
c h a r a c t e r i z e d in that TA-values and field
strength values are obtained from a general interface which
is utilized between the base station and BSC in just any
5 TDMA-system.

7. Method according to patent claim 2,
c h a r a c t e r i z e d in that the A-bis interface
between the base station and BSC in the GSM-system is
utilized to obtain TA-values and field strength values.

10 8. Method according to patent claim 7,
c h a r a c t e r i z e d in that TA-values and signal
strength values are fetched by means of loggings in the A-
bis interface.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00030

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04B 7/005, H04B 7/26, H03G 3/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04B, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0431956 A2 (MOTOROLA INC.), 12 June 1991 (12.06.91), column 2, line 16 - line 50; column 4, line 31 - line 45; column 5, line 50 - column 6, line 2, abstract	1-4
Y	---	5-8
Y	EP 0631453 A2 (TELIA AB), 28 December 1994 (28.12.94), column 1, line 14 - line 26; column 3, line 19 - line 33, abstract	5-8
X	US 5151704 A (K. GUNMAR), 29 Sept 1992 (29.09.92), column 2, line 1 - line 54, abstract	1
Y	---	2-4

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

24 June 1997

Date of mailing of the international search report

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5390338 A (STIG R. BODIN ET AL), 14 February 1995 (14.02.95), column 1, line 53 - line 60, abstract --	2-4
Y	WO 9205672 A1 (TELEVERKET), 2 April 1992 (02.04.92), page 3, line 17 - line 19; page 4, line 4 - line 23; page 5, line 14 - line 23, figure 3, abstract	5-8
A	-- -----	2-4

INTERNATIONAL SEARCH REPORT
Information on patent family members

03/06/97

International application No.

PCT/SE 97/00030

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EP 0631453 A2	28/12/94	SE 500769 C SE 9302140 A US 5564079 A	29/08/94 29/08/94 08/10/96
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